

1 **Specification**

2 **A WORKFLOW SYSTEM FOR DETECTION AND CLASSIFICATION OF IMAGES**  
3 **SUSPECTED AS PORNOGRAPHIC**  
4

5 This application is a continuation-in-part of Ser. No. 09/823,139 Filed March 29th,  
6 2001 titled Automated Detection of Pornographic Images.  
7

8 **Background of the Invention**  
9

10 **Field of the Invention**

11 This invention relates generally to the field of workflow based image analysis and  
12 classification and more particularly to a classification of images suspected as pornographic in  
13 nature or images suspected as being of a copyright nature.  
14

15 **Description of Prior Art**

16 A variety of methods have been used in an attempt to detect and categorize  
17 objectionable images. Pornographic-free web sites, such as sites targeting families and  
18 children have been set up for shielding children from viewing objectionable material.  
19 Although a particular site may be pornographic free, and considered acceptable for access by  
20 children, it is still possible to gain access to an objectionable web site by starting from an  
21 acceptable site. Software applications and Internet services such as Net-Nanny and Cyber-  
22 Sitter were created and marketed to help parents prevent their children from accessing  
23 objectionable documents by blocking access to specific web sites.

24 One type of protective software is designed to store the addresses of objectionable  
25 web sites, and block access to these sites. Example of prior art are US 5,678,041 to Baker and  
26 Grosse, US 6,049,821 to Theriault et. al., and US 6,065,055 to Hughes and Elswick.

27 Another form of software protection screens the text information accessed by a  
28 computer from the network and blocks information sources that are considered objectionable.  
29 Examples of such prior art include US 5,832,212 to Cragun & Day, US 5,835,722 to  
30 Bradshaw and Shih, US 5,996,011 to Humes, US 6,065,056 to Bradshaw and Shih, and US  
31 6,266,664 to Russell-Falla & Hanson.

32 Such methods are prone to error as many words have subtle double-meanings which  
33 can easily be misinterpreted by such software and other words commonly used in everyday  
34 conversation can be easily taken out of context. Further, although such software does have a

1 role to play in content management it does not address the fundamental issue of determining  
2 the nature of graphical content on large image collections such as Internet photo  
3 communities.

4 Yet another type of protective software blocks access to URLs except those that are  
5 members of a list of manually approved URLs. Examples of prior art include US 5,784, 564  
6 to Camaisa et. al. and US 6,286,001 to Walker & Webb.

7 These approaches are not highly effective because it is a practical impossibility to  
8 manually screen all of the images on all of the web sites that are added each day to the web.  
9 They rely on either storing a local database of website URLs, or referencing the database on  
10 the Internet.

11 Other approach such as described in U.S. patent 5,668,897 by Stoflo (09/16/1997),  
12 categorizes images based on a unique image signature into a database for later retrieval and  
13 comparison. Such solutions are limited by a known collection of images, which will always  
14 be a subset of images created.

15 Various image-processing algorithms have been investigated for use in detecting  
16 objectionable media. For example, algorithms have been tested for use in recognizing  
17 shapes, such as people in general, and specific body parts. A detailed summary of work done  
18 with algorithms is found in David A. Forsyth and Margaret Flich, Finding Naked People,  
19 Journal Reviewing, 1996 and Margaret Flich, David A. Forsyth, Chris Bregler, Finding  
20 Naked People, Proceedings of 4th European Conference on Computer Vision, 1996; and  
21 David A. Forsyth et al., Finding Pictures of Objects in Large Collections of Images,  
22 Proceedings, International Workshop on Object Recognition, Cambridge, 1996. However, all  
23 of the above describe individual approaches to analyzing single images using single criteria.  
24 None of these publications provide an algorithm/system even close to a robust system, which  
25 can be practically used.

26 Several patents in this field were granted. U.S. patent 6,148,092 to Qian et. al.  
27 (11/14/2000) describes a method of detecting skin-tone and in particular detecting faces,  
28 using a luminance chrominance algorithm, which is limited to well defined and full bodies.  
29 U.S. patent 5,638,136 to Kojima et. al. (06/07/1997) describes yet another method of  
30 detecting flesh-tone, and again, this method is limited to well defined chrominance  
31 information.

32 In unrelated fields, Japan patent 09237348A to Hiroshi et. al (09/09/1997) describes a  
33 method of determining the posture of a body. Hiroshi et. al. has limited usefulness being  
34 again, dependent on color segmentation of an image. US 6,182,081 to Dietl et. al. describes a

1 method for performing an interactive review of the data contents of a computer with a view to  
2 the manual screening of objectionable material contained thereon. However, this method is  
3 limited to screening text data against a list of objectionable words and collecting all image  
4 data in a thumbnail form for manual review. Thus it is not suitable for application to very  
5 large collections of images.

6 In order for an algorithm to be useful for screening objectionable images, it is  
7 necessary for the algorithm to achieve a very high ratio of the number of objectionable  
8 images correctly identified to the total number of objectionable images in a database.  
9 Unfortunately, no algorithm can determine with full accuracy if an image is of pornographic  
10 nature or simply an artistic nude, erotic image or an image with a large amount of skin tone  
11 but not of any offensive nature. PCT application of USA application WO00/67204 to  
12 Papazian et. al. describes the advantage of using a multiple selection of images to increase the  
13 overall likelihood, using the fact that the distribution of the likelihood of detection is spread  
14 in a Gaussian fashion and the variance is reduced as a function of the samples. However,  
15 Papazian et. al. are not utilizing the cross information that one can achieve from a collection  
16 of images, but merely using a statistical improvement.

17 Similarly in the field of copyright detection. The research work and patents applied all  
18 relate to different methods and techniques of watermarking images and then detecting  
19 watermarked images. Such techniques are described in EPO EP1/126408 to Wen et. al  
20 (22/08/2001) describing a method of detecting embedded information in images. US patent  
21 06,259,801 B1 to Wakasu (07/10/2001) describes watermarking and detecting of  
22 watermarked images using DCT methods. US patent publication US2001/0002931 A1 to  
23 Maes describes means of detecting images that were marked using geometrical shapes. The  
24 drawback in such an approach is that individual detection of watermarked images does not  
25 easily or practically lend itself to any form of automatic or workflow solution.

## 26 27 28 SUMMARY

29  
30 The primary object of the invention is to provide a more accurate screening tool for  
31 suspected pornographic images.

32 A further object is to increase human body detection accuracy beyond skin-tone  
33 criteria.

1 Another object of the invention is to enable pornographic screening for synthetic  
2 images as well as black-and-white or graphic images.

3 Another object of the invention is to provide faster tools for searching for  
4 pornographic images.

5 A further object of the invention is to provide an enterprise software workflow  
6 solution to screen images.

7 Yet another object of the invention is to improve productivity by combining an  
8 automated process for large volume and a secondary manual process for the final decision-  
9 making.

10 Another object of the invention is to provide more efficient tools for searching and  
11 detecting copyrighted images.

12 Briefly, a preferred embodiment of the present invention includes an enterprise based  
13 workflow server based system to detect and classify images as potentially of pornographic  
14 nature. The system is based on two independent stages. The first stage is an automatic stage  
15 which eliminates most images that are positively non pornographic, including an image  
16 analysis engine with a plurality of sub engines, each dedicated to different attributes of an  
17 image. The second stage describes an additional embodiment of a manual review stage. An  
18 alternative embodiment describes a similar server solution to detect images suspected as  
19 copyrighted material. The images can be individually classified, or analyzed as a cluster or a  
20 collection of images such as an album or motion-picture segment, sampled into key still  
21 frames. The system optimizes time saving by elimination of images, and assures accuracy by  
22 generating a workflow reviewing solution which can involve a human decision-making stage.

23 An alternative embodiment describes utilizing the same system with different  
24 detection criteria to classify images suspected to be copyrighted.

25 An advantage of the present invention is that it provides a workflow solution to  
26 handle a review of a large amount of digital images.

27 A further advantage is that the workflow includes an automated step, which  
28 eliminates most images and a manual stage, which is of higher accuracy, while dealing with a  
29 smaller number of images.

30 A still further advantage of the present invention is that it provides a modular  
31 architecture that is scalable and adjustable based on the load and the load balancing needed.

32 Another advantage of the present invention is that the automatic classification module  
33 can be fine tuned or changed without changing the workflow.

1 A still further advantage of the method of the present invention is that web sites  
2 providing images to the public can block any display of inappropriate pornographic material.

3 Another advantage of the method of the present invention is that businesses that sell  
4 and license images can prevent unlawful usage of such images.  
5

## 6 **In the Drawing**

7 Fig. 1 is a schematic block diagram of the components in the workflow system;

8 Fig. 2 shows a flow chart of the workflow;

9 Figure 3 describes the workflow of an individual analysis engine;

10 Figure 4 illustrates the manual review workflow;

11 Figure 4A illustrates the process of setting up priority criteria for the manual  
12 reviewing queue;

13 Figure 5 illustrates the workflow for an alternative embodiment wherein the analysis  
14 engine is utilized to detect copyrighted material;

15 Figure 5A illustrates the components of the imaging engine as related to copyright  
16 material;

17 Figure 5B illustrates the components of the imaging engine as related to offensive  
18 graphical material; and

19 Figure 6 illustrates the user interface look and feel of the reviewer's console.  
20

## 21 **Detailed Description of the Preferred Embodiment**

22 The method of the present invention applies to the detection of pornographic images  
23 transmitted over a communications network, and includes single or still images, motion-  
24 picture segments and collections of images such as albums. Alternatively, the system can  
25 detect images of copyrighted nature.

26 In accordance with the present invention, Figure 1 illustrates a schematic diagram of  
27 the workflow system components. The system includes end users 300, which subscribe to a  
28 photographic community 310, in particular, but not limited to an Internet based photo-sharing  
29 site. Images in such community 310 can be stored individually 312, in clusters or otherwise  
30 known as collections or albums 314, which can be physical or virtual. Images can be of  
31 different file formats and different nature, including and not limited to still images 312 (such  
32 as jpeg, GIF, TIF, Jpeg200 etc file formats), or digital movies 316 such as MPEG, AVI, and  
33 MP4 etc. A pornography detection server can be on a separate machine connected to the  
34 main site via a known Application Protocol Interface (API). The physical connection 320 can

1 be via a local network, or via the Internet or Intranet. The Porn server 330 also has image  
2 detection engines 340 which again can be dedicated CPUs or part of a single configuration.

3 The engines 340 perform the analysis of the individual images. The engine itself  
4 includes scheduler 346 for controlling the retrieval and processing steps for the images, an  
5 input stack 344 which retrieves the images in the background, thus saving time and  
6 improving the efficiency of the system by eliminating communication and bandwidth delays  
7 for retrieval of the images. The engine has sub-engines 350,352,354,356 and 358 each  
8 performing a different analysis. The sub-engines include an engine to perform shape analysis  
9 of body parts 350, an engine to analyze skin tone 352,an engine to analyze texture of skin  
10 354, an engine to analyze text that accompanies the image, such as title or description 356,  
11 and a curvature analysis 358. A likelihood-analyzer 342 receives all information from the  
12 sub-engines to create a single value of likelihood also referred to as combined likelihood that  
13 the image is pornographic. The statistical likelihood may be expressed as a probability value  
14 which is a number expressing the likelihood that the image is of pornographic nature,  
15 expressed as the ratio of the number of actual occurrences to the number of possible  
16 occurrences. Alternatively, other statistical likelihood measures may be provided based on a  
17 variety known of statistical metrics.

18 All data about the images, including meta-data, which is additional data on the image  
19 provided by the site 310, and their classification and categorizations etc. are stored on a  
20 central database 360. The images themselves can be saved as a pointer to their storage  
21 location on the photo-community 310. Alternatively, the porn server 330 also includes a  
22 storage facility for the images 368 which can act as a temporary storage for the images. The  
23 images can be in full resolution as provided by the photo community 310. As an additional  
24 embodiment, images can be subsampled or reduced in size to an optimal size, which is small  
25 enough but still enable good detection of images. The subsampling engine 324 can perform  
26 subsampling as part of the transformation of the image from the photo-community 310 to the  
27 server 330. In case there are issues of bandwidth, the subsampler module 324 can be located  
28 on the photo-community side prior to sending the images to the server. In case there is no  
29 bandwidth issues such subsampling can be executed before the images are provided to the  
30 engines 340. The image storage component 368 can be for temporary storage of images as  
31 part of the review process, or alternatively this storage can be used as the long-term storage  
32 for the images as part of the long-term storage of the photo-community, depending on the  
33 architecture of the system at large.

1 The database 360 links to the stored images 368 as well as stores meta data  
2 information about the images. When images and meta data are stored in the database in block  
3 360, the database stores them in two tables. The first table 362 is for the individual images,  
4 the second 364 is for a collection of images, i.e. albums. Each album points to individual  
5 image entries in the image table 362. A third table 366 includes information as to the  
6 reviewing process such as a reviewer's log in and password, statistics on each reviewer,  
7 priority of sorting images, rating system etc. A queuing system 370 determines the order of  
8 images and or albums to be reviewed by the reviewers 380. The reviewers may include a  
9 plurality of stations, which are linked to the queuing system 370 via an internal network or  
10 even directly through HTML pages on the Internet. Special reviewer 382 may be assign as a  
11 supervisor 382 which may determine the priorities, assign reviewers etc.

12 Referring to the flow diagram of the image analysis workflow in Figure 2, a user 300  
13 uploads a single image or a collection of images 305 to the site 310. The images are stored  
14 307 by the user individually 312 or as a collection 314 or motion pictures 316. Upon  
15 receiving a new batch of images, the photo-community server 310 sends a request 315 to the  
16 porn server 330. Such a request can be packaged as an XML request or any available  
17 communication command between applications. To eliminate redundancies of sending the  
18 same images multiple times, and to ensure unique classification of images, each image and  
19 each collection should include a unique image identification that both the photo-community  
20 310 and the server 330 can refer to. The Porn-server 330 receives images and places 335 the  
21 images and associated information in the database 360. The information is placed in the two  
22 tables 362 for individual frames and 364 for collection of frames. In an additional  
23 embodiment, the server can also store the images 369 in its storage 368. Alternatively, only a  
24 link to the images can be stored in the database, while the images are still linked to their  
25 original storage location on the photo-site 310. An additional step can be a subsample of the  
26 images 325 before they are stored and processed. Such subsample can occur on the photo  
27 community 310 if bandwidth is an issue between the photo-community and the server, or as  
28 part of the transfer process 315. In the case of motion picture data, the subsampling process  
29 also means selecting key frames forming the movie clip. This is done once again to conserve  
30 bandwidth and later on unnecessary repeated calculations by the engine. Individual scenes in  
31 a movie are usually a repeat of previous frames with slight modifications, which depicts  
32 object movements or camera movements. Therefore, as part of the subsampling process, it is  
33 sufficient to only select key frames, one or a few from each scene. Alternatively, a movie  
34 collection can be sampled in equal or random frame intervals.

1 The images are placed in a queue 337 waiting to be processed by the engines 340. An  
2 engine, when free, pulls the queue 341 and if images are waiting, retrieves them and process  
3 them. A detailed description of the engine 340 functionality is provided in Figure 3. An  
4 automatic reply is sent to the server and placed 345 in the associated tables for images and  
5 collections of images in the database 360 in the image table 362. Due to the pull nature of this  
6 system, many engines can work concurrently on the same database, thus creating a very  
7 scalable system. Due to the fact that the engines are in a separate thread, or even on a separate  
8 machine, the system can also be highly optimized for stress and load balance.

9 The automatic reply can be made available to the photo-site using the same protocol  
10 320 that was utilized to place the images in the queue. Such a reply can be individual  
11 likelihood results for an image, or a collective likelihood for an album. The reply can be sent  
12 to the photo-community 339 as a job is finished. Alternatively, the photo-community can  
13 query regarding a specific image, or a collection as defined in step 319. Such a reply or query  
14 can include a list of most suspected images, or a sorted list by likelihood, wherein the most  
15 suspected images are provided up front. Alternatively, the results can be queried based on  
16 unique image identification.

17 Referring to the flow diagram of the engine 340 as illustrated by Figure 3, after being  
18 placed in the database, images and or collections of images are placed in a queue. It is the  
19 role of the engines, which can be one or many, to query the queue. The management and  
20 scheduling of the different analysis an image goes through is all controlled by the scheduler  
21 346. The first task is to retrieve 402 the image and associated meta data from the server, and  
22 specifically from the database table 362 and the image storage 368. The Input process is  
23 separate from the actual analysis to allow multi processing. While one job is being analyzed,  
24 the next job is being retrieved 402 and placed 406 in a temporary storage of the engine. By  
25 doing so, the engine can be optimized for an optimal tradeoff between bandwidth to get the  
26 images and time to analyze them.

27 In the case of a movie clip, an additional step may occur wherein the movie clips are  
28 segmented and still frames are extracted, as described in step 325. The retrieved images are  
29 then sent by the scheduler to the individual analysis modules. Images are sent in step 450 to  
30 the shape analysis engine to detect indicative shapes associated with body parts.  
31 Independently, images are sent in step 452 to the skin tone analysis engine where human  
32 bodies are classified based on color attributes. Similarly, images are sent 454 to the Texture  
33 analysis engine where the picture is analyzed to identify bodies based on texture  
34 characteristics. Any textual meta data associated with an image and or collection, such as



1 image names, comments etc. are sent 456 to the textual analysis engine, where suspicious  
2 words and sentences are being patterned and matched. The images are also sent 458 to a  
3 curvature analysis sub-engine 358 for possible matching with shapes based on curves.

4 Alternatively, each or some of the sub-engines may be concatenated. For example, the  
5 skin-tone sub engine may classify some regions. This information along with the image will  
6 be then sent to the curvature engine and the latter will examine only images marked by the  
7 former engine. Any combination and ordering may be executed by the scheduler to improve  
8 the accuracy and speed of the process. Additionally, other sub engines can be added to the  
9 process if deemed necessary. Such engines may be based on specific meta data that is  
10 provided by the site 310, or any improved detection technology. Such additions of new sub  
11 engines can be done transparently to the process workflow process and therefore the  
12 advantage of the system as defined.

13 The data from all sub engines is then analyzed 420 by the combined likelihood  
14 calculator 342. A single parameter is then generated to describe the overall probability that  
15 an image is of pornographic nature. The formulae for this calculation can be tweaked and  
16 optimized as the process matures. The individual probabilities along with the combined  
17 likelihood are then returned to the main database.

18 Fig. 4 shows an additional embodiment wherein images can be sent to a manual  
19 reviewing engine for a definitive classification. As a preparatory step, supervisor 382 can  
20 determine 482 some rules 385 as to the order that images should be reviewed. Figure 4A.  
21 illustrates such priority list which can be modified by the supervisor. The supervisor may  
22 assign primary, secondary tertiary etc. criteria for sorting the queue based on different  
23 criteria. Such rules can be to review images based on the statistic likelihood of individual  
24 images 800, the collective likelihood of albums 802, percentage of images suspected 804, or  
25 the total number of images suspected 806 etc.

26 Other criteria can include additional information or meta data associated with the  
27 images such as the number of pageviews 820, which is the number of times an image was  
28 viewed, sorting by the date the image was uploaded 810, or the time the image was in the  
29 queue 812.

30 Other criteria may include meta data provided by the photo-community 310 such as  
31 prior offenses that a user may have 830, etc. In figure 4A as an illustrative example, the  
32 supervisor marked the first sorting criteria 861, to be pageviews 830, second sorting 862 to be  
33 the statistical likelihood 810 and the third criteria 863 to be the upload date and time 802.

1       Reviewers, which can be one or many, can login 486 and logout 512. While 488  
2 images are still in the review queue 370, any free reviewing station pulls the next image or  
3 selection of images within in the queue. An album is being displayed 492 on the reviewer's  
4 screen as further illustrated in Figure 5. The interface between the reviewing station and the  
5 database can be via some secure HTML communication or any Interface language such as  
6 XML. In such a manner, reviewers may log into the system remotely and out of the site's  
7 internal security system such as a firewall. With this architecture, multiple reviewers can be  
8 added as needed based on the load of the system and the productivity of the reviewers.

9       The reviewers can assign 494 classification of individual images or a collection. If a  
10 reviewer is not sure as to the rating of an image or a collection as defined in step 496, the  
11 images can be sent 498 for a second and deciding opinion by the supervisor. The supervisor  
12 will then repeat similar reviewing process as the reviewer did.

13       Upon assigning a rating, either by the reviewer or a supervisor, the data is returned  
14 510 to the database 360. The results from the database can be sent to the photo community or  
15 asynchronously retrieved by the photo community upon request as described in Figure 2  
16 blocks 339 and 319 respectively.

17       Figure 6 depicts an example of a potential user interface of the reviewer. The window  
18 in which a reviewer works can be HTML based. The information included includes an action  
19 window 610 wherein the reviewer can toggle between views, go to the next album or send  
20 albums to the supervisor when the reviewer is not sure as described in Figure 4 block 498.  
21 The information also includes a text window 600 with the meta data that may help the  
22 reviewer in deciding as to the rating, such as the number of hits, which is also referred to as  
23 "page views", or otherwise number of people that looked at the images, additional text which  
24 alternatively can be highlighted or marked by the textual analysis engine 356, the ration  
25 between the total number and the suspected number of images etc. In terms of the user  
26 interface, any parameter that is beyond the acceptable normal can be marked differently, such  
27 as highlighted, marked in red etc. to immediately attract the reviewer's attention. Object 640  
28 displays the pertinent information as to the current reviewed album. Block 630 displays the  
29 images themselves. The images may be displayed in reduced size, also termed as thumbnails,  
30 or as full resolution. The reviewer may decide to view all images of the album or toggle to an  
31 alternative view where only the suspected images are displayed. This workflow will enable  
32 fast detection of suspected albums. The reviewer can then assign a rating, which can be  
33 redefined by the site. Different sites may have different needs, which vary by countries, and  
34 audience. One rating which is very important is the ability to mark images as illegal as

1 illustrated in block 620. Illegal images include for example child pornography. Such albums  
2 are immediately moved up the queue and may be reported especially to the server 330 and to  
3 the client photo-community 310 for immediate action.

4 As alternative embodiments, due to the modular structure of the server, additional  
5 components can be easily added if needed. For example the detection engines may extend  
6 beyond pornographic detection and include a detection engine for copyrighted material. This  
7 is a useful tool to block images that have been unlawfully taken from other sources such as  
8 other webs sites and other publications. The reviewing system is identical to the one as  
9 explained in the main embodiments. All the difference is in the type of sub-engines used  
10 within the engine 340. Figure 5A illustrates the components of the engine 740 as related to  
11 copyright material. Such a tool can be of great use for companies that are trying to protect  
12 their visual assets. Examples include celebrities, news agencies and image banks.

13 Referring to components of the imaging engine 740, which is the engine 340 modified  
14 to support copyright detection as illustrated by Figure 5A, the sub-engines that will be used  
15 include a watermarking detection engine 751, a halftone pattern recognition engine 753, a  
16 textual analysis engine 755 and a graphical analysis engine 757. The textual analysis may  
17 also detect unique signatures that an image may have in its header or meta data which can  
18 link it to its original owner. The graphical analysis engine may detect known copyrighted or  
19 trademarked logos, signs or figures.

20 Referring to workflow of the copyright violation detection system illustrated by  
21 Figure 5, the images will pass through the sub engines described in Figure 5A to detect if  
22 images include watermarking 750 in them; detect the possibility that images were unlawfully  
23 scanned from printed publications such as magazines 752, search for key words such as  
24 famous people, current events news etc. 754, and search for known graphical logos and  
25 symbols 756.

26 Of course, a hybrid system that can include both pornographic material and copyright  
27 violation material can be constructed by combining the pornographic detection engines 350,  
28 352, 354, 356, and 358 with the copyright violation detection 751, 753 and 755.

29 As further embodiments of the present invention, due to the modular structure of the  
30 server, additional detection engines may extend beyond pornographic detection and copyright  
31 violation detection to include a detection engine for graphically-offensive material. This is a  
32 useful tool to prevent for example hate-crime related material or offensive political  
33 propaganda material. As an example, such material may include the presence of the Swastika  
34 symbol in images, logos of supremacy organization etc. As described before, the reviewing

1 system is identical to the one as explained in the main embodiments. All the difference is in  
2 the type of sub-engines used within the engine 340. Figure 5B illustrates the components of  
3 the engine 840 as related to offensive graphical material.

4 Graphical images can be stored digitally in various ways. In particular, they can be of  
5 photographic pixel representation, which is a grid based representation of image, artificial  
6 line-art representation such as drawings of art objects and vector representation which is a  
7 mathematical formulae to represent separate shapes such as lines, polygons and text, and  
8 groups of such objects, as opposed to bitmaps.

9 Referring to components of the imaging engine 840, which is the engine 340 modified  
10 to support detection of offensive material as illustrated by Figure 5B, the sub-engines that  
11 will be used include a line-art analyzer 790, a pixel analyzer 792 and a vector analyzer 794.

12 In conclusion, the reader may see that the workflow solution as described in the  
13 present invention can be used to increase productivity and improve the detection capability of  
14 imaging based reviewing systems. Specifically, such a system can ensure the absence of  
15 pornographic material on community based web sites.

16 In addition to the increased throughput of the automated system, the present invention  
17 also describes a manual workflow stage in which reviewers can efficiently review images and  
18 classify them. Furthermore, due to the modular structure of this architecture, new detection  
19 components can be added without the need to redesign or affect the workflow and or the  
20 interface of this system. Furthermore, such server-based image reviewing solution can be  
21 utilized for other purposes involving inappropriate use of images, such as the detection of  
22 copyrighted material.

23 Although the description above contains many specificities, these should not be  
24 construed as limiting the scope of the invention but as merely providing illustrations of some  
25 of the presently preferred embodiments of this invention. Various other embodiments and  
26 ramifications will be apparent and possible within it's scope for those skilled in the art. Thus  
27 the scope of the invention should be determined by the appended claims and their legal  
28 equivalents as covering all such alterations and modifications that fall within the true scope  
29 and spirit of the invention, rather than by the examples given.

30 In the claims:  
31